

CLAIMS

1. A method of producing a carbon nanostructure wherein a carbon crystal is grown by vapor phase epitaxy from a crystal growth surface of a catalyst base (17) including a catalyst material (11), wherein
5 said catalyst base (17) is formed by diameter-reduction processing.

2. The method of producing a carbon nanostructure according to claim 1, wherein
10 said catalyst base (17) is formed as an aggregate including an arrangement of a plurality of catalyst structures each formed with a non-catalyst material (12), a material not having a substantial catalytic function for growth of said carbon crystal, formed on at least a portion of a side surface of said catalyst material (11) of a columnar shape having said crystal growth surface as a top surface.

15 3. The method of producing a carbon nanostructure according to claim 2, wherein
a non-catalyst material (15) is formed on at least a portion of a side surface of said aggregate, and said catalyst structures have variations of at most CV 10% in
20 surface areas of said catalyst material (11) on said crystal growth surface.

4. The method of producing a carbon nanostructure according to claim 2, wherein
said catalyst material (11) is formed with at least one of a member selected from
25 the group consisting of Fe, Co, Mo, and Ni, and said non-catalyst material (12) is formed with Ag and/or an Ag-containing alloy.

5. The method of producing a carbon nanostructure according to claim 2,

wherein

surface processing is performed by at least one of oxidation, nitriding and carbonization to define an interface between said catalyst material (11) and said non-catalyst material (12) on said crystal growth surface.

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6. The method of producing a carbon nanostructure according to claim 2, wherein

said catalyst base (17) having a multilayer structure is formed by alternately stacking said catalyst material (11) and said non-catalyst material (12) by a vapor phase method.

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7. The method of producing a carbon nanostructure according to claim 1, wherein

said diameter-reduction processing is performed by at least any of drawing, extrusion, rolling, and forging.

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8. The method of producing a carbon nanostructure according to claim 1, wherein

said diameter-reduction processing is performed such that, an outside diameter of a solid or hollow catalyst material (11) after the diameter-reduction processing becomes at least 1×10^{-6} % and at most 1 % of that before the diameter-reduction processing.

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9. The method of producing a carbon nanostructure according to claim 1, wherein

said catalyst material (11) has a multilayer structure on the crystal growth surface.

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10. The method of producing a carbon nanostructure according to claim 1,
wherein

5 said catalyst base (17) is formed such that, said catalyst material (11) has at least
any of a round shape, a ring-like shape, a polygonal shape, a spiral shape, a waved shape,
and a branching shape on the crystal growth surface.

11. The method of producing a carbon nanostructure according to claim 1,
wherein

10 mechanical polishing and/or sputtering is performed as surface processing for
said crystal growth surface.

12. The method of producing a carbon nanostructure according to claim 11,
wherein

15 an ion is entered into said catalyst material (11) before and/or after said surface
processing.

13. The method of producing a carbon nanostructure according to claim 1,
comprising the steps of:

20 supplying carbon from a non-crystal growth surface of said catalyst base (17) to
set at least a portion of carbon in said catalyst material (11) to a saturated state; and
growing a carbon crystal from said crystal growth surface.

14. The method of producing a carbon nanostructure according to claim 1,
wherein

25 a reducing gas is brought into contact with at least the crystal growth surface of
said catalyst material (11) before or during growth of the carbon crystal.

15. The method of producing a carbon nanostructure according to claim 1,

wherein

a material gas and/or carbon is ionized and brought into contact with said catalyst base (17).